Post-Closure Plan

Post-closure care and use of the property at the Slag Pit Sump will be performed in compliance with 40 C.F.R. §§265.117 through 265.120 as described briefly in the following sections. During the post-closure care period, FMC Idaho, LLC (FMC) will perform the post-closure monitoring activities in accordance the applicable performance standards specified in 40 C.F.R. §§265.117, 265.228 and 265.310, which include the following:

- ***§§265.228(b)(1); 265.310(b)(1):*** Requires that the integrity and effectiveness of the final cover be maintained, including making repairs to the cover as necessary to correct effects of settling, subsidence, erosion, or other events;
- ***§§265.228(b)(3); 265.310(b)(3):*** Requires that the groundwater monitoring system be maintained and monitored to comply with 40 C.F.R. Subpart F, as applicable;
- ***§§265.228(b)(4); 265.310(b)(4):*** Requires the prevention of run-on and run-off from eroding or otherwise damaging the final cover; and
- ***§§265.310(b)(5):*** Requires that benchmarks be protected and maintained per 40 C.F.R. §265.309.

Activities to be performed during the Slag Pit Sump post-closure care period shall be conducted to ensure that the Owner/Operator complies with the above-specified standards as well as the September 2012 Interim Record of Decision Amendment for the FMC Plant OU of the Eastern Michaud Superfund Site (IRODA), which requires that the CERCLA remedy integrate the existing RCRA caps with the development of new caps. This August 2014 amendment of the Post-Closure plan embodies the integration of the RCRA Post-Closure Plan for the Slag Pit Sump and the CERCLA remedial action for the area that encompasses this unit. .During the period of time that the CERCLA evapotransporative (ET) cap is being constructed in Remedial Area B (RA-B) as specified in the IRODA, an area that encompasses the Slag Pit Sump, FMC, FMC will continue groundwater monitoring activities; perform inspections of the closure area cover; and conduct maintenance activities for the closure area cover, and security systems. Post-closure monitoring activities will continue for a period of up to 30 years, unless shortened or lengthened by the Regional Administrator in accordance with 40 C.F.R. §265.117. FMC will petition EPA to reduce the post-closure monitoring period in accordance with 40 C.F.R. §265.118(g) in the event the Company concludes that a monitoring period of shorter duration is warranted. Following completion of construction of the ET cap and EPA approval of the CERCLA Operations, Monitoring and Maintenance (OM&M) Plan for the CERCLA soil remedy, the post-closure inspection and maintenance for the the Slag Pit Sump closure area cover will continue under this plan. The post-closure activities that will be performed at the Slag Pit Sump are summarized in Figure 10-1. Table 10-1 summarizes monitoring/inspection activities, reporting frequencies, triggers and response actions to be taken.

During the post-closure period, information about post-closure activities can be obtained by contacting:

- Associate Director, EHS Remediation
  FMC Idaho, LLC

  1735 Market Street
  Philadelphia, PA
  215/299-6700

1. Groundwater Monitoring Wells

FMC will perform periodic sampling and analysis of monitoring wells as specified in the groundwater monitoring program. These wells will include three downgradient wells (108, 122, and 123) and one upgradient well (121).

2. Inspections

FMC conducted quarterly inspections of the closure area for the first five years, after completion of closure in 2005, and since such time, inspections have been conducted semiannually. As the EPA comments on the March 2014 draft OM&M plan have indicated that inspections of the ET Cap on RA-B will be conducted quarterly for at least the first year, inspections of the slab pit sump closure area cover will revert to quarterly on the effective date of this amended post-closure plan and continue quarterly for the next five years. After that five-year period, inspections will be conducted semi-annually. Inspections will also occur within 48 hours of each 25-year, 24-hour storm event. Inspections will include the following: closure area cover (i.e., surface of the fill material and the ET cap constructed per the CERCLA remedial action over the slag pit sump), recent rodent or insect activity (such as fresh soil piles or holes), settlement monument[1], ditches, drainage systems, warning signs, security, and groundwater monitoring wells.

3. Maintenance Activities

The closure area will be maintained, as needed, on the basis of the inspection records or as necessitated by unusual natural events, such as severe storms. The required repairs will be performed by FMC as soon as practical. The maintenance work may include the following:

(a) Maintenance of closure area cover

- Replacing lost soil and/or damaged cover
- Maintaining drainage channels
- Controlling cover damage, including cracks, excessive settlement, ponding water, low spots, erosion channels, and rodent intrusions
- Contingency plans for damage caused by severe storms or natural events

(b) Maintenance of monitoring systems

- Monitoring well repair or replacement

Maintenance or repair of settlement monument[1]

(c) Maintenance of security systems

- Warning signs

[1] The settlement monument on the Slag Pit Sump cover will be re-established on the ET cap over RA-B. During the period of construction of the ET cap, including grading, the settlement monument will not be available for inspection. When re-established, the frequency of monitoring will be reset as described in Section 4.0.

FIGURE 10-1
POST-CLOSURE ACTIVITY CHECKLIST FOR SLAG PIT SUMP– FMC IDAHO, LLC, POCATELLO, IDAHO

TABLE 10-1
SLAG PIT SUMP POST-CLOSURE ACTIVITY CHECKLIST

Post-closure Monitoring/Inspection Activity	Record/Report	Activity Frequency	Reporting Frequency *	Trigger(s)	Action(s)	Closure Plan Reference
Groundwater monitoring						
Quarterly monitoring	Quarterly data validation report	Quarterly	Quarterly	Error(s) in laboratory or field data [1]	• Repeat measurement • Check and/or repeat calibration • Repair or replace measuring device • Collect and analyze new samples [1]	Sections 4 & 5; Attachment 10-1
Annual groundwater assessment	Statistical evaluation, and Annual Assessment Report	Annually	Annually	Required annually	Evaluate and perform statistical assessment of groundwater analytical results. Re-evaluate the rate and extent of migration, as necessary. [1]	Attachment 10-1
Quarterly inspections						
Closure area cover	Inspection log	Quarterly	Annually	Visual or electronic indication of degradation or damage	Repair or replace as soon as practical	Section 10
Monument	Inspection log	Quarterly	Annually			
Drainage systems	Inspection log	Quarterly	Annually			
Security/signs	Inspection log	Quarterly	Annually			
Monitoring wells	Inspection log	Quarterly	Annually			
25-year, 24-hour storm event inspection	Inspection log	w/in 48-hours	w/ Annual	Same as quarterly	Same as quarterly	Section 10.7
Settlement monitoring						
After final RA-B cap	Survey report	Annually	Annually	Exceeds acceptable rates	Engineering evaluation/repair	Section 10.4
Visible subsidence or local seismic event	Survey report	As soon as practical	Annually	Exceeds acceptable rates	Engineering evaluation/repair	Section 10.4
RCRA regulations/plant operations	Post-closure Plan	60 days	60 days	Operational or regulation changes	Revise the Post-closure Plan	Section 10

Reference: [1] Interim Status Groundwater Monitoring Plan, August 1999

Note: * Unless greater or lesser frequency is approved by EPA.

A copy of this post-closure plan will be maintained at the FMC HS&E office and will be made available to EPA upon request. The plan will be amended as necessary to accommodate any events or changes in operations at the facility or changes in governing regulations that could impact the Slag Pit Sump post-closure activities. Such an amendment (if necessary) will be submitted to EPA Region 10 at least 60 days prior to any proposed change in operations or within 60 days after any unexpected event that affects the Slag Pit Sump post-closure plan. After completion of post-closure care, FMC will certify completion of the post-closure activities as specified in 40 C.F.R §265.120.

The closure is inside an operating plant of FMC, which has adequate equipment and manpower to perform emergency repair work such as grading, replacement of asphaltic concrete, and drainage systems as needed.

10.1 POST-CLOSURE NOTICES

Within 60 days after certification of closure and no later than the submittal of the certification of closure shown in Section 9 of this closure plan, FMC will submit to the local zoning authority, or the authority with jurisdiction over the land use, and to the Regional Administrator a record of the type, location, and quantity of waste placed in the sump as described in 40 C.F.R §265.119(a).

Within the same time frame and in accordance with 40 C.F.R. §265.119(b), FMC will record a notation on the deed to the facility property that will in perpetuity notify any potential purchaser of the property that the land use is restricted under 40 C.F.R. Part 265, Subpart G regulations, and that a survey plat (as required under 40 C.F.R. §265.116) has been filed with the local authorities in accordance with 40 C.F.R. §265.119(b)(1)(iii). To protect the integrity of the cap and ongoing monitoring systems, land use restrictions will include prohibition of subsurface intrusion within 20 feet of the limits of the final cap (LFC). FMC will comply with all the post-closure notices required under 40 C.F.R. §265.119 briefly described above.

After completion of post-closure care, FMC will certify completion of the post-closure activities as specified in 40 C.F.R. §265.120.

The survey plat (referenced above) will identify the location of the as-built RCRA cap. It will be completed by a professional land surveyor and filed with the local land use authorities. The property within the limits of the survey plat will be restricted from any post-closure use which could jeopardize the integrity of the RCRA cap or interfere with ongoing monitoring and maintenance activities. To protect the integrity of the cap, land use restrictions will include

prohibition of subsurface intrusion within 20 feet of the limits of the final cap (LFC). Appropriate barrier systems will be provided to protect the surveyed benchmarks from damage.

10.2 SECURITY SYSTEM

The Slag Pit Sump is wholly enclosed within the boundaries of the active portion of an operating facility which itself has a combination of fencing, natural barriers and 24-hour surveillance to monitor and control entry. Access to the closed unit is further controlled because of its location within the slag pit which helps prevent inadvertent access of unauthorized persons.

Signs will be posted in the vicinity of the Slag Pit Sump to be seen from any approach to the closed unit. A minimum of one sign adjacent to the sump, and one sign, outside and above the slag pit. The signs will be in English only, and will read 'Danger-Unauthorized Personnel Keep Out'. FMC will authorize specific personnel limited access to perform inspection, repair, maintenance, sample collection, and similar activities required for post-closure care.

10.3 INSPECTION

The closure area, including the final RCRA cap, will be inspected quarterly for the first five years after closure in 2005, and semiannually thereafter. As the EPA comments on the March 2014 draft OM&M plan have indicated that inspection of the ET Cap on RA-B will be conducted quarterly for at least the first year, inspections of the slag pit sump closure area will revert to quarterly on the effective date of this amended post-closure plan and continue quarterly for five years. After that five-year period, inspections will be conducted semiannually. The cap will be inspected within 48 hours after each 25-year, 24-hour storm event. Any degradation, erosion, slopes, failures, settlement, cracks, or damage will be recorded with related recommendations for repair or maintenance in the facility's operating record. All necessary repairs will be performed by FMC. Upon completion of repairs, a reinspection will be performed to document the date and acceptability of the repairs. A sample Inspection Record Form is provided in Figure 10-2. A final Facility Inspection Record Form for multiple regulated activities may be prepared and substituted for this form. This Facility Inspection Record Form will include all of the unit-specific information. Table 10-2 provides additional details on the types of inspections, the frequency and the maintenance action.

Documentation of all repairs or maintenance activities will also be maintained in the facility's operating record on site. All repairs to the final cover will be in accordance with the procedures as specified in the final cover construction specifications, including all testing and inspections as required by the final cover CQA plan (Appendix F of this Closure Plan).

Item/Condition Checklist	Inspection Results				Reinspection[2]		
	Date/ Time	Signature	Acceptable	Unacceptable[1]	Date/ Time	Signature	Acceptable
Monitoring Wells (groundwater, temperature, pressure) *- Barrier poles intact* *- Well covers intact and locked*							
Settlement Monitors *- Clear and accessible (after re-establishment)*							
Surveyed Benchmarks *- Clear and accessible*							
Cover Material Conditions *- No damage to asphalt concrete* *- No excessive erosion* *- No evidence of rodent or insect intrusion* *- No excessive ruts or potholes*							
Storm Water Management *- Swales clear of excess sediment/debris*							
Security Systems *- No evidence of uncontrolled access* *- Signage intact*							
Slopes *- No sloughing or tension cracking* *- No excessive channels or washouts*							
Others							

Notes:

(1) Explain the unacceptable conditions of each item; recommend any repairs (attach additional pages if necessary).

(2) Reinspect after satisfactory completion of any necessary repairs and note the acceptance of the repairs.

FIGURE 10-2. INSPECTION RECORD FORM, FMC IDAHO, LLC, POCATELLO, IDAHO

TABLE 10-2
SLAG PIT SUMP MAINTENANCE ACTIVITIES

Inspection Item	Inspection Frequency	Maintenance Action	Cross Reference
Groundwater monitoring wells			
Field equipment	Quarterly	Repair or replace defective/damaged equipment	Attachment 10-1b
Laboratory equipment	Quarterly	Recalibrate; repair or replace defective equipment	Laboratory QAPP; Attachment 10-1b
Well covers	Quarterly	Replace damaged well covers	Section 10.3
Barrier poles	Quarterly	Repair or replace damaged barrier pole(s)	Section 10.3
Lock(s)	Quarterly	Replace missing or inoperable locks	Section 10.3
Closure area cover	Quarterly	Repair damage, replace closure area cover	Section 10.6
Monument	Quarterly	Repair or replace damaged monument	Section 10.3
Drainage systems	Quarterly	Clear channels and ditches of sediment and debris	Section 10.7
Signs	Quarterly	Replace signs	Section 10.3

10.4 CLOSURE AREA COVER SETTLEMENT MONITORING

To monitor closure area cover settlement, the elevation and coordinates of the monument will be surveyed to determine the vertical and horizontal components of the final cover monument. Measurements will be taken on the monument annually. For accuracy, a surveying instrument will be used to take measurements with the following tolerances:

- Elevation readings 0.01 foot
- Horizontal displacement 0.1 foot

Elevation and displacement measurements will be plotted cumulatively versus time. The time scale will be in logarithm of time or square root of time. The settlement curve will be kept up to date with each reading.

The displacement measurements (vertical and horizontal movements) will be made annually during the remaining post-closure period or until the total cumulative movements for the last five years are less than the following limits:

- Vertical settlement 0.03 foot
- Horizontal movement 0.2 foot

Displacement measurements will be made (1) at least once every five years during the post-closure period after these limits are reached; (2) if marked, visible subsidence is noted during semiannual inspections or routine maintenance; and (3) after local seismic events.

Settlement monitoring will be based on control stations “94-1” and 94-4”, which are local stations in FMC’ survey control system. The coordinates for these stations were derived from US Coast & Geodetic Survey (US C&GS) Control Station MCDOUGAL-2 and BM Y-96. The vertical datum is based on the 1968 adjustment of the National Geodetic Vertical Datum of 1929 (NGVD 29) by the US C&GS.

Any damaged monument detected during post-closure inspections either will be repaired or replaced in accordance with the construction drawings and specifications used during closure (Appendix F).

10.5 GROUNDWATER MONITORING

As indicated in Section 3, past activities at the Slag Pit Sump have impacted groundwater in the area. Therefore, groundwater monitoring will continue during the post-closure period. Groundwater from designated RCRA monitoring wells upgradient and downgradient of the Slag Pit Sump will be sampled and analyzed on a periodic basis, to provide data regarding groundwater quality beneath and in the vicinity of the Slag Pit Sump during the post-closure period. Groundwater monitoring with respect to the Slag Pit Sump will be conducted in accordance with the compliance monitoring program identified in Section E.7 of the RCRA Part B Permit Application. The Sampling and Analysis Plan for post-closure groundwater monitoring is contained in Attachment 10-1 of this section. The one upgradient and three downgradient groundwater monitoring wells will be sampled for the following parameters :

- Heavy metals – arsenic, cadmium, and selenium (quarterly)
- Water quality – ammonia, chloride, fluoride, potassium, nitrate, sulfate, orthophosphate, and total phosphorus (quarterly)
- Field parameters – pH, turbidity, temperature, water level, and specific conductance (quarterly)
- Elemental phosphorus (semi-annually)

Groundwater monitoring will continue until such a time as a demonstration can be made for reduced frequency or parameters. In this event, FMC will petition EPA to reduce the post-closure monitoring period in accordance with 40 C.F.R. §265.118(g). The monitoring program might also be changed as necessitated by the CERCLA activities at the site, or as required by either the FMC facility Part B or Post-Closure Part B Permits.

10.6 CLOSURE AREA COVER MAINTENANCE

The cover surface will be maintained regularly, as necessary, to maintain the closure area cover . Maintenance of the closure area cover components will be performed as needed. Eroded surface soils will be replaced. Surface slopes will be maintained to prevent any localized ponding. If regular inspections detect vector activity, such as fresh soil piles or holes, the damage will be repaired and traps set for rodent control. If excess settlement is observed and possible damage to the low permeability barrier is suspected, a registered Professional Engineer will be consulted to assess potential damage and recommend any necessary repairs. FMC will perform the repairs as

part of the scheduled quarterly maintenance program. Table 10-2 provides additional details on the types of inspections, the frequency, and the maintenance action.

All maintenance work performed in accordance with this section will be consistent with any maintenance work to be performed on the CERCLA RA-B ET cap pursuant to an EPA-approved CERCLA soil remedy OM&M plan.

10.7 STORM WATER MANAGEMENT

The Slag Pit Sump storm water management system will be inspected and repaired quarterly, and within 48 hours after each 25-year, 24-hour storm event. Sediment and trash accumulations in the channels will be removed to facilitate proper drainage. Eroded channels will be repaired.

All maintenance work performed in accordance with this section will be consistent with any maintenance work to be performed on the CERCLA RA-B ET cap pursuant to an EPA-approved CERCLA soil remedy OM&M plan.

10.8 RECORD KEEPING AND REPORTING

Closure and Post-closure Plans, including cost estimates, monitoring data, inspection records, and certifications are part of the facility operating record. The operating record is located in the facility's Health, Safety and Environmental (HS&E) Department files. Except for inspection records, which must be kept for 3 years, the information contained in the operating record will be maintained at the facility until closure and/or post-closure (in the case of groundwater monitoring information) have been completed.

FMC will report to EPA Region 10 as required by RCRA regulations and the FMC RCRA Consent Decree, entered October 16, 1998: groundwater monitoring data, emergency incidents, and other situations potentially threatening to human health or the environment.

ATTACHMENT 1

Contents

Attachment 1a

QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE PROJECT PLAN
RCRA Groundwater Monitoring at the
FMC Idaho, LLC
Pocatello Facility

Tables

Figures

Quality Assurance Project Plan for RCRA Groundwater Monitoring of the Slag Pit Sump (WMU # 5)

1. PROJECT MANAGEMENT

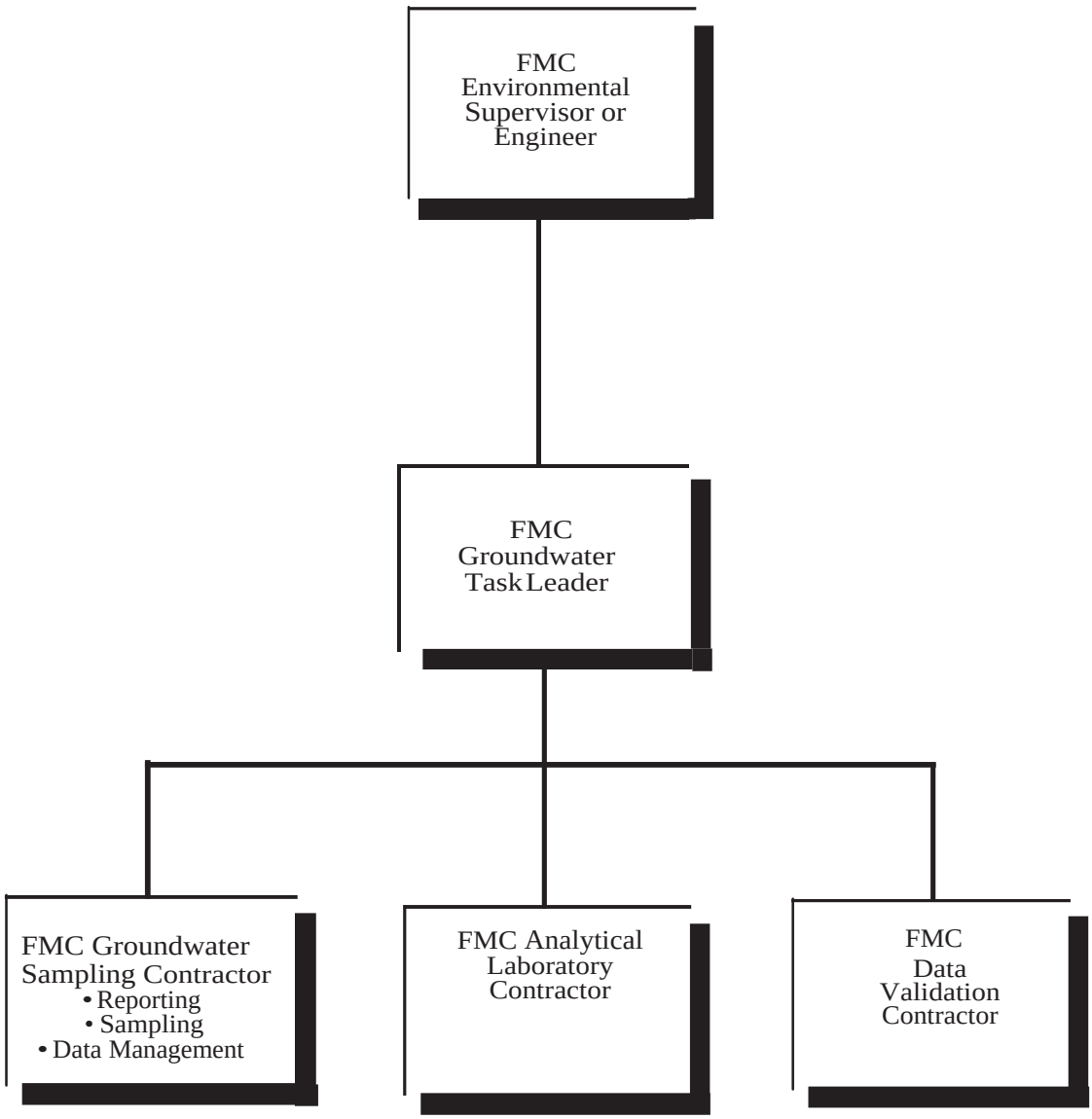
This plan describes the quality assurance and quality control requirements for the Resource Conservation and Recovery Act (RCRA) groundwater monitoring program that is to be implemented at the FMC Idaho, LLC (FMC) Pocatello Elemental Phosphorus Plant. This plan was prepared following EPA guidelines for Quality Assurance Project Plans (QAPP) in EPA SW-846 (EPA 1997) and in EPA Guidance for Quality Assurance Project Plans, EPA QA/R-5 (EPA, 1994) and pursuant to applicable 40 C.F.R. 264 Subpart F criteria and objectives. This plan will be revised when appropriate, per 40 C.F.R. §270.42. The requirements of this plan are implemented through a series of ten field sampling plans. Attachment 10-1b is the field sampling plan for the Slag Pit Sump. The field sampling plans provide the detailed field procedures that will be used to conduct groundwater monitoring at each waste management unit. This QAPP and the associated field sampling plans constitute a RCRA sampling and analysis plan for groundwater monitoring at the Pocatello Elemental Phosphorus Plant.

This document is organized as follows: Section 1 presents project management information and requirements; Section 2 provides study design and implementation requirements ensuring that appropriate methods for sampling, analysis, data handling and quality control are employed and properly documented; Section 3 addresses the requirements for assessing the effectiveness of the quality control measures described in this plan; and Section 4 provides requirements for data validation and assurance of data usability.

1.1 PROJECT ORGANIZATION

The project organization is shown in Figure 1. The responsibilities of key project personnel are as follows:

- FMC Environmental Supervisor or Engineer - responsible for overall project quality
- FMC Environmental Supervisor or Engineer - responsible for review, monitoring, auditing, and evaluation of performance of sampling and analytical subcontractors.
- FMC Groundwater Monitoring Task Leader - responsible for managing all site field activities including direct management of field supervisors and subcontractors. Also responsible for assembly, organization and maintenance of all information collected during field activities.



BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO	
FMC IDAHO, LLC POCATELLO, IDAHO	
Project Organization	
Job Number: 20906	Drawing No.: Figure 1
	Rev.: 0

- FMC Groundwater Sampling Contractor - responsible for the representativeness of samples collected and reporting of field data relevant to groundwater monitoring and data management. Also responsible for maintenance of groundwater monitoring database.
- FMC Analytical Laboratory Contractor QA Officer - responsible for the accuracy and precision of data resulting from analysis of groundwater monitoring samples.
- FMC Data Validation Contractor - responsible for data validation

All personnel are responsible for identifying problems that may arise in the collection and reporting of project data and overseeing the implementation of the necessary corrective actions.

The FMC Groundwater Monitoring Task Leader will inform the FMC Environmental Supervisor or Engineer of any such problems and corrective actions. The FMC Environmental Supervisor or Engineer will track, review, and verify of effectiveness of corrective actions.

1.2 BACKGROUND

The FMC Pocatello facility has been in continuous operation since 1949. RCRA groundwater monitoring has been conducted at the facility since 1990, when the plant became subject to RCRA Subtitle C permitting and groundwater monitoring standards. The plant is a RCRA treatment, storage, and disposal facility (EPA Identification Number IDD 070929518).

1.3 PROJECT DESCRIPTION

This section identifies and provides a schedule and specifies the nature of the ground water monitoring at each of the FMC Waste Management Units (WMUs) subject to RCRA groundwater monitoring requirements. Each WMU and associated RCRA upgradient and downgradient groundwater monitoring wells are identified in Table 1, and their locations are depicted in Figure 2.

1.3.1 PROJECT SCHEDULE

Monitoring under the 40 C.F.R. Part 265 groundwater monitoring standards is on-going on a quarterly basis. The scope of groundwater monitoring (e.g., set of analytes, selection of wells) will be revised, as appropriate, to reflect the requirements of a RCRA permit or alternate enforceable documents for post-closure care pursuant to 40 CFR §270.1(c)(7), once issued.

TABLE 1
RCRA GROUNDWATER MONITORING WELLS

		Monitoring Well I.D. Numbers		
WMU No.	**WMU Name**	**Upgradient**	**Downgradient**	**Nature of Monitoring Program**
3	Phossy Waste Surface Impoundment (Pond 15S)	165	113, 115 and 166	Detection
5	Slag Pit Sump	121	108, 122, and 123	Compliance
7	Phossy Waste Surface Impoundment (Pond 8S)	158, 183	155, 156, and 157	Compliance
8	Phossy Water Clarifier Surface Impoundments (11S, 12S, 13S, and 14S) -- Phase IV Ponds	167	104, 114, 131, and 168	Detection
9	Precipitator Slurry Drying Surface Impoundment (Pond 9E)	124, 113	126, 127, and 128	Detection
10	Phossy Waste Surface Impoundment (Pond 16S)	154	147, 148, and 149	Detection
11	Precipitator Slurry Surface Impoundment (Pond 8E)	167	104, 114, 131, and 168	Detection
14	Pond 17	173	171, 172, and 180	Detection
15	Pond 18 Cell A	174	154, 177, and 178	Detection
na	na	na	Batiste Spring	na

na not applicable

DRAWN BY D. Severson

5 May 2014

Legend

- FMC property boundary
- Shallow monitoring well
- Deep monitoring well
- Abandoned shallow monitoring well
- Abandoned deep monitoring well
- Spring
- Production well
- Abandoned production well
- Routine RCRA well
- Waste management unit

Michaud IRR
TANK FARM
ROWLANDS
BATISTE SPRING
TW-11I
TW-11S
TW-12S
Frontier
New Frontier
OLD PILOT
NEW PILOT
LINDLEY
WILLIAMSEN
FMC-1
FMC-3
FMC-4
FMC-5
FMC-6
TW-2S
TW-2I
TW-2D
TW-3D
TW-3S
TW-4S
TW-4I
TW-4D
TW-5I
TW-5D
TW-5S
TW-7S
TW-8S
TW-9S
TW-10S
IDAHO POWER
Slag Pit Sump
Pond 9E
Pond 16S
Pond 15S
Pond 8E
Pond 8S
Phase IV Ponds
Pond 18 Cell A
Pond 17

N
W
E
S

0 500 1000
Feet

MWH

FMC

FIGURE 2

LOCATION OF WASTE MANAGEMENT UNITS & ASSOCIATED MONITORING WELLS

I:\FMCidaho\FMC_REMEDIAL DESIGN\FIGURES\Fig2_FMC_WasteMngmntUnits_and_Assoc_Wells.mxd

1.4 QUALITY OBJECTIVE AND CRITERIA FOR MEASUREMENT DATA

The overall objective of the groundwater monitoring program is to collect samples representative of the groundwater flowing beneath each of the WMUs.

To meet these objectives, data of known quality will be collected and analyzed. To facilitate the required statistical analyses, discussed below, analytical methods with the lowest routinely achievable detection limits will be used. This will assure that the required statistical analyses are performed using as many positively detected values as possible.

1.4.1 DETECTION MONITORING

The objective of the detection monitoring program is to verify that the WMUs are not leaking, and if the unit were to leak, to provide early warning. To meet this objective, groundwater samples from the monitoring wells associated with each WMU must be analyzed for the parameters specified in Table 3A. The acceptable level of uncertainty is also specified in Table 3A as precision and accuracy goals. Results from analysis of samples collected from downgradient detection monitoring wells at each detection monitoring WMU will be compared to results from analysis of samples collected from the associated upgradient wells to determine if there is statistically significant evidence of a release. The required statistical tests and levels of significance are presented in the RCRA Interim Status Groundwater Monitoring Plan (FMC, 1999).

1.4.2 COMPLIANCE GROUNDWATER MONITORING

The objective of the compliance monitoring program is to verify that concentrations of contaminants previously released from a WMU are not increasing above concentrations specified in the Groundwater Protection Standard for the WMU. To meet this objective, groundwater samples from the monitoring wells associated with each WMU must be analyzed for the parameters specified in Table 3B. The acceptable level of uncertainty in these measurements is specified in Table 3B as precision and accuracy goals. Results from analysis of samples collected from upgradient and downgradient monitoring wells at each compliance monitoring WMU will be compared to groundwater protection standards presented in Table 2. The required statistical tests and levels of significance are presented in the RCRA Interim Status Groundwater Monitoring Plan (FMC, 1999). .

1.5 PROJECT NARRATIVE

As described in Section 1.4, groundwater monitoring at the FMC Facility will be conducted to detect leaks and determine if concentrations exceed groundwater protection standards. To meet the objective, on a quarterly basis unless otherwise specified, groundwater samples will be collected from the locations specified in Table 1 in accordance with the requirement specified in the companion Field Sampling Plan(s) and the procedures in the applicable WMU-specific FSP. Samples will be handled in accordance with the requirements specified in the companion Field Sampling Plan(s) and submitted for analysis in accordance with the requirements specified in Table 3. Data generated from analysis of groundwater samples will be reviewed and analyzed in accordance with the requirements specified in Section 4.

1.6 SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

All personnel directly involved in sample collection, handling, analysis, and data evaluation will be provided with a copy of this QAPP and the applicable field sampling plan(s). Personnel will be trained in the requirements specified herein, or provided ample time to read and become familiar with the requirements prior to beginning data collection activities.

1.7 DOCUMENTATION AND RECORDS

Records of the analyses and evaluations required by this plan will be maintained by FMC at the Pocatello plant, throughout the active life of the facility, as well as throughout the post-closure care period. Data reporting requirements to EPA are specified in the RCRA Interim Status Groundwater Monitoring Plan (FMC, 1999). Laboratory documentation and records requirements are specified in the laboratory QAPP. Required field documentation is specified in the companion Field Sampling Plan.

TABLE 2
GROUNDWATER PROTECTION STANDARDS (GWPS)

Constituent[1]	Pond 8S		Slag Pit Sump	
	GWPS (mg/L)[4]	Basis[2]	GWPS (mg/L)	Basis[2]
Arsenic	0.54	ACL	0.18	ACL
Cadmium	0.005	MCL	0.005	MCL
Cyanide	0.2	MCL	0.2[5]	MCL
Selenium	0.11	ACL	0.1	ACL
Vanadium	0.26[3]	MCLE	0.26[3]	MCLE

Notes:

[1] 40 C.F.R. §264, Appendix IX inorganic constituents.

[2] GWPS basis is shown as either the MCL, MCL equivalent (MCLE), or ACL based on DAF to Batiste Spring.

[3] MCL equivalent, based on a 70-kg adult consuming 2 liters of water/day, 350 days/year for 30 years. MCL, MCLE, and background concentration are not available for sulfide.

[4] The GWPS proposed for Pond 8S are considered to be appropriate for initial consideration as a GWPS for Ponds 8E, 9E, 15S, 16S, 17, and 18 and the Phase IV ponds, should any of these WMUs become subject to compliance monitoring in the future.

2. MEASUREMENT/DATA ACQUISITION

The groundwater monitoring described in this plan is consistent with the program described in the RCRA Interim Status Groundwater Monitoring Plan (FMC, 1999). This section provides requirements for sampling program design, sample collection, handling, analysis, and data management. These requirements ensure that appropriate methods for sampling, analysis, data handling, and quality control are employed and documented.

2.1 SAMPLING METHODS REQUIREMENTS

The groundwater monitoring wells associated with each WMU will be sampled in accordance with the detailed procedures presented in the applicable WMU specific field sampling plan.

2.2 SAMPLE HANDLING AND CUSTODY REQUIREMENTS

The groundwater samples will be handled and custody will be maintained in accordance with the detailed procedures presented in the applicable WMU specific field sampling plan.

2.3 ANALYTICAL METHODS REQUIREMENTS

The analytical methods that will be used on groundwater monitoring samples are summarized in Table 3. The table specifies method number, method type, and method detection limit ranges. Method detection limits presented on Table 3 for each analysis represent the best reporting limits that can be attained by the specified methodology. Data from multiple dilutions will be used, as necessary, to quantify target components within the calibrated range. Actual detection limits obtained during analysis will be reported by the laboratory for each parameter in each sample.

The laboratory performing the analyses will have an established QA/QC plan and all analyses will be performed in accordance standard operating procedures consistent with the QA/QC plan. Where analytical or QA/QC procedures presented in the QAPP are different from those presented in the laboratory QA/QC plan, procedures presented in this QAPP will govern.

TABLE 3A
SUMMARY OF REQUIRED ANALYSES
DETECTION MONITORING PROGRAM

Parameter	Method Number	Method Type	Method Detection Limit (ppm)	Accuracy*	Precision**
Ammonia	350.3 [1] (a)	Potentiometric, Ion Selective Electrode	0.2	70% - 130%	± 35%
Potassium	6010B (b)	Inductively Coupled Plasma Atomic Emission Spectrometry	5	70% - 130%	± 35%
Chloride	325.3 [1] (a)	Titrimetric (mercuric nitrate)	all ranges	70% - 130%	± 35%
Fluoride	340.2 [1] (a)	Potentiometric, Ion Selective Electrode	0.1	70% - 130%	± 35%
Arsenic, cadmium, selenium	6010B, 6010B, 6010B (b)	Inductively Coupled Plasma Atomic Emission Spectrometry	0.005, 0.005, and 0.005	70% - 130%	± 35%
Nitrate	353.2 [1] (a)	Colorimetric (brucine sulfate)	0.1	70% - 130%	± 35%
Orthophosphate	365.2[1] (a)	Colorimetric (ascorbic acid)	0.1	70% - 130%	± 35%
Sulfate	375.4 [1] (a)	Gravimetric	5	70% - 130%	± 35%

(a) Methods for Chemical Analysis of Water and Wastes, EPA –600/4–82-D55, Method 300.0A or SW–846 Method 9056 may be used as an alternate method, if appropriate.

(b) Test Method for Evaluating Solid Waste, EPA SW–846, Third Edition, Update III, as revised through 1997.

[1] No equivalent SW–846 method

* percent recovery

** relative percent difference

TABLE 3B
SUMMARY OF REQUIRED ANALYSES
COMPLIANCE MONITORING

Parameter	Method Number	Method Type	Method Detection Limit (ppm)	Accuracy*	Precision**
Ammonia	350.3 [1] (a)	Potentiometric, Ion Selective Electrode	0.2	70% - 130%	± 35%
Potassium	6010B (b)	Inductively Coupled Plasma Atomic Emission Spectrometry	5	70% - 130%	± 35%
Chloride	325.3 [1] (a)	Titrimetric (mercuric nitrate)	all ranges	70% - 130%	± 35%
Fluoride	340.2 [1] (a)	Potentiometric, Ion Selective Electrode	0.1	70% - 130%	± 35%
Nitrate	353.2 [1] (a)	Colorimetric (brucine sulfate)	0.1	70% - 130%	± 35%
Total Phosphorus	365.4[1] (a)	Colorimetric	0.01	70% - 130%	± 35%
Orthophosphate	365.2[1] (a)	Colorimetric (ascorbic acid)	0.1	70% - 130%	± 35%
Phosphorus (P_4) [3]	7580 (b)	Gas Chromatography/Nitrogen–Phosphorus Detector	0.00001	70% - 130%	± 35%
Sulfate	375.4 [1] (a)	Gravimetric	5	70% - 130%	± 35%

Footnotes

(a) Methods for Chemical Analysis of Water and Wastes, EPA –600/4–82-D55, Method 300.0A or SW–846 Method 9056 may be used as an alternate method, if appropriate.

(b) Test Method for Evaluating Solid Waste, EPA SW–846, Third Edition, Update III, as revised through 1997.

[1] No equivalent SW–846 method

[2] Annual analysis required.

[3] Semi-annual analysis required

* percent recovery

** relative percent difference

2.4 QUALITY CONTROL REQUIREMENTS

Both field and laboratory quality control (QC) checks will be employed to evaluate field contamination, the variability of field techniques and the performance of laboratory analytical procedures. QC checks will take the form of samples introduced into the analytical stream to enable evaluation of sampling and analytical accuracy and precision.

Such QC samples will be regularly prepared in the field and laboratory so that all phases of the sampling process are monitored. The following QC samples will be collected.

2.4.1 FIELD DUPLICATES

Field duplicate samples will be collected for use as a measure of the precision of the sample collection and analysis process. The duplicate will be submitted with minimal indication of the site it was taken from. Duplicates will be prepared following standard sampling and preparation techniques as described in the applicable FSP and submitted to the laboratory at a frequency of one duplicate sample for every ten routine samples.

2.4.2 LABORATORY QA/QC SAMPLES

Laboratory QA/QC samples will be collected by the sampling team for use as a measure of analytical accuracy and precision. The laboratory QA/QC sample will be collected following standard sampling and preparation techniques as described in the applicable FSP and submitted to the laboratory at a frequency of one duplicate sample for every twenty routine samples. Samples designated as laboratory QA/QC samples will be twice the routine sample volume. Other specific requirements associated with laboratory QA/QC are specified in the laboratory QAPP.

2.5 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE REQUIREMENTS

All equipment used in the conduct of this work will receive routine maintenance checks in order to minimize equipment breakdowns. Maintenance checks will generally coincide with calibration checks. Any equipment found to be operating improperly will be taken out of use, and a notation stating the time and date of this action will be made in a log book. The equipment will be repaired, replaced or recalibrated, as necessary, and the time and date of its return to service will also be recorded.

2.6 INSTRUMENT CALIBRATION AND FREQUENCY

The requirements in this section pertain to the calibration of field equipment. Laboratory equipment will be calibrated in accordance with an established QA/QC plan and all calibrations will be performed in accordance standard operating procedures consistent with the QA/QC plan. Additional requirements related to laboratory instrument calibrations and frequency requirements are specified in the laboratory QA/QC plan. All calibrations of field equipment will be recorded in appropriate log books. Table 4 provides a summary of field equipment calibration requirements.

2.7 INSPECTION/ACCEPTANCE REQUIREMENTS FOR SUPPLIES AND CONSUMABLES

Groundwater sample containers will be new or precleaned and supplied by the laboratory performing sample analysis. All other consumables will be decontaminated prior to use in accordance with the equipment decontamination procedure presented in the applicable field sampling plan.

2.8 DATA ACQUISITION REQUIREMENTS (NON-DIRECT MEASUREMENTS)

To meet groundwater monitoring objectives at the FMC Facility, no data from non-direct measurements are required, other than that collected during groundwater sampling and sample analysis.

2.9 DATA MANAGEMENT

Data from both the field and the laboratory will be managed during this project. Field data will consist of field notebooks and chain of custody forms. Notebooks and chain of custody forms will be retained by the groundwater sampling contractor until the end of each quarterly sampling event, then forward to the FMC Groundwater Monitoring Task Leader for retention.

The laboratory documentation required for each sample delivery group depends on the anticipated level of review. Section 2.9.1 presents the documentation requirements of data

TABLE 4
SUMMARY OF FIELD EQUIPMENT CALIBRATION REQUIREMENTS

Field Measurement	Instrument	Calibration Procedure	Calibration Frequency	Precision
Water Level Survey	Electrical Water Probe Steel Tape	Reference to Steel Tape Reference to New Tape	Periodically Periodically	0.05 ft 0.01 ft
Water pH	pH Meter	2-point Buffer Solutions	Daily	0.1 pH unit
Specific Conductance	Conductivity Meter	KCl Reference Solution	Daily	±1%
Turbidity	Turbidity Meter	2-point Factory Supplied Turbidity Standards	Daily	±0.1% full scale or ±0.05% NTU (1)
Water Temperature	Thermometer	Factory Calibration; periodic reference to boiling water at known atmospheric pressure		0.5°C

(1) The precision of the turbidity meter is the greater of 0.1% full scale or 0.05% of measurement in NTU, according to the manufacturer (LaMotte, Inc.).

validation and Section 2.9.2 presents the documentation requirements for data review. The Groundwater Sampling Contractor will maintain the analytical database.

2.9.1 LABORATORY DOCUMENTATION FOR DATA VALIDATION

The following documentation will be provided by the laboratory for each sample delivery group scheduled for validation:

1. Case Narrative
2. Chain of Custody Documentation
3. Summary of Results
4. QA/QC Result Summaries
5. Raw Data

The format and detailed content of the laboratory documents will support validation of the data in accordance with EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (EPA 1994). An electronic data deliverable will be provided by the laboratory in a file format specified by FMC that is compatible with dBase III software. The deliverable will contain the fields specified in Table 5. Data packages for full validation will be forward by the laboratory to the data validation contractor. At the same time a copy of items 1 through 4 will be forwarded to the FMC Groundwater Monitoring Task Leader for retention.

2.9.2 LABORATORY DOCUMENTATION FOR DATA REVIEW

Each sample delivery group of laboratory data not planned for validation will include items 1 through 4 described above in the same level of detail as required if the data were to be validated. Item 5, Raw Data, is not required. An electronic data deliverable will be provided by the laboratory in a file format specified by FMC. The deliverable will contain the fields specified in Table 5. Items 1 though 4 will be forwarded to the FMC Groundwater Monitoring Task Leader for retention.

3. ASSESSMENT/OVERSIGHT

Annual surveillance of sampling activities will be conducted. The surveillance will be conducted by the FMC Environmental Supervisor or Engineer or his designee. The field surveillances will focus on adherence to procedures outlined in the field sampling plan and will include field observation of sampling procedures, selected documentation (e.g., field log books). Laboratory audits will be conducted in accordance with the laboratory quality assurance plan. Field surveillance reports and

TABLE 5
DATABASE FIELD ACRONYMS AND DESCRIPTIONS

DATABASE FIELD NAME	Type	Size	FULL NAME	DESCRIPTION
STA_ID	Text	12	Station ID:	well number, etc. (i.e., A308300 or S308108)
AGENCY	Text	8	Agency	investigating party (EPA)
SAMP_DATE	Date/Time	8	Sample Date	date sample was taken
SAMP_ID	Text	8	Sample ID	unique identification number given to each sample
WTR_DEP	Number (Double)	8	Water Depth	depth to where water is found from casing reference notch (in ft.)
WTR_ELEV	Number (Double)	8	Water Elevation	elevation above mean sea level of groundwater (in ft.)
CHEM_NAME	Text	36	Chemical Name	name of chemical
CAS_NO	Text	12	Chemical Abstract Service Number	number that is given to identify a unique chemical by the Chemical Abstract Service
CONC_DET	Number (Double)	8	Concentration Detection	chemical concentration that was detected
QUAL	Text	4	Qualifier	laboratory qualifier given to each sample
UNITS	Text	12	Units	units of measurement
QUAL_VAL	Text	4	Validation Qualifier	qualifier assigned as a result of data validation
QUAL_CODE	Text	6	Code Qualifier	code used by validation to indicate why a qualifier was assigned
VAL_LVL	Text	4	Validation Level	level or extent of validation done
CHEM_NO	Number (Double)	8	Chemical Number	chemical number given by FMC for database sorting

TABLE 5 (CONT'D)
DATABASE FIELD ACRONYMS AND DESCRIPTIONS

DATABASE FIELD NAME	Type	Size	FULL NAME	DESCRIPTION
SAMP_TYPE	Text	4	Sample Type	e.g., groundwater (GW), surface water (SW) or potential source (PS) sample
LAB_NAME	Text	12	Laboratory Name	name of laboratory that performed the analyses
LAB_ID	Text	12	Laboratory Identification	identification number given to a sample by laboratory
QUAL_ANAL	Text	4	Analysis Qualifier	lab-assigned qualifier (see Qualifier Description)
QUAL_SAM	Text	8	Qualifying Sample	sample qualifier indicating that sample is not representative (see Qualifier Description)
AN_DATE	Date/Time	8	Analytical Date	date sample was analyzed for constituents
AN_METHOD	Text	20	Analytical Method	method used for analyzing chemicals
PKG_NAME	Text	9	Package Name	laboratory sample delivery group (SDG)
ACTUAL_VAL	Number (Double)	8	Actual Value	actual value shown for accuracy, used only for radiological
ACCURACY	Number (Double)	8	Accuracy	± accuracy (for rad samples)
RPT_LIM	Number (Double)	8	Reporting Limit	laboratory required reporting limit
FILE_NAME	Text	8	File Name	chronological name of an event

laboratory audit reports will be forward to the FMC Environmental Supervisor or Engineer. Audit findings which require corrective action and follow-up will be documented and tracked and will have resolution verified by the FMC Environmental Supervisor or Engineer.

3.1 ASSESSMENTS AND RESPONSE ACTIONS

If it appears that field or laboratory data are in error, the error(s) or potential error(s) will be documented and appropriate corrective action(s) will be taken. Corrective actions may include one or more of the following:

- Measurements may be repeated to check the error
- Calibrations may be checked and/or repeated
- Instrument or measuring device(s) may be replaced or repaired
- New samples may be collected, and/or samples may be reanalyzed.

All field and laboratory personnel will be responsible for identification of problems and implementation of corrective actions. During field and laboratory activities, problem descriptions and corrective actions taken will be thoroughly detailed and entered into notebooks. If the FMC Environmental Supervisor or Engineer, FMC Groundwater Monitoring Task Leader, FMC Analytical Laboratory Contractor QA officer, or other project personnel become aware of any problems in sample collection or analysis that cannot be corrected in the field or laboratory, they will initiate formal corrective action and notify the FMC Environmental Supervisor or Engineer and prepare a Corrective Action Report. The FMC Environmental Supervisor or Engineer will also be notified of problems identified and corrective actions taken during field activities. Appropriate corrective actions will be determined on a case-by-case basis.

3.2 REPORTS TO MANAGEMENT

The surveillance and audit findings will be included in the corresponding quarterly groundwater monitoring results and data validation reports. Each report, as appropriate, will include a section which provides an overall assessment of the performance of the field and laboratory programs based on the audits.

4. DATA VALIDATION AND USABILITY

The following subsection present requirements for activities that occur after the data collection phase of the project is complete.

4.1 DATA REVIEW, VALIDATION, AND VERIFICATION REQUIREMENTS

All data generated by this project will be reviewed by the FMC Groundwater Monitoring Task Leader to ensure they are consistent with previous results and previously observed data trends. Ten percent of the analytical results or one sample delivery group, whichever is greater, will be validated. The other ninety percent will receive a QC and Blank Check to ensure the sampling and analytical program are operating within control limits. The QC and Blank Check will include examination of field duplicate sample results and laboratory QA/QC sample results. All electronic copy entries will be verified against hard copy results reported by the laboratory and field sampling personnel, unless the electronic copy is produced using the same laboratory information management system.

4.2 VALIDATION AND VERIFICATION METHODS

The required data review may be conducted informally during report preparation; it should include a comparison of the current and previous quarter results for water levels and chemical parameters measured at each well sampled. The QC and Blank Check will be conducted by compiling the results of field duplicate samples and laboratory QA/QC samples and assessing whether the sampling and analytical processes are operating within control limits. Generally, these processes are considered in control if the relative percent difference between field duplicate pairs is less than 30 percent and if the laboratory QA/QC sample results meet the criteria specified in the applicable method. Data validation will be conducted in accordance with EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (EPA 1994).

4.3 RECONCILIATION WITH USER REQUIREMENTS

To meet the project objectives specified in Section 1.4, the data analyses specified in the RCRA Interim Status Groundwater Monitoring Plan (FMC, 1999) will be performed. If sufficient data of known quality have been generated to complete these analyses, then the project objectives have been met.

5. REFERENCES

Bechtel Environmental Inc. (BEI), 1996. "RCRA Interim Status Groundwater Monitoring Plan," Revised June 1996.

EPA, 1983. "Methods for Chemical Analysis of Water and Wastes," EPA 600/4-82-D55, revision March 1983.

EPA, 1994. "EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review", February 1994.

EPA, 1994. "EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations, EPA QA/R-5, Draft Interim Final, August 1994.

EPA, 1997. "Test Methods for Evaluating Solid Waste," EPA SW-846, 3rd edition, May 1997.

FMC Corporation (FMC), 1995. "RCRA Interim Status 1994 Groundwater Monitoring Assessment," February.

FMC, 1999. "RCRA Interim Status Groundwater Monitoring Plan," FMC Corporation, Phosphorus Chemical Division, Pocatello, Idaho, August, 1999.

FMC Corporation (FMC), 2000. "RCRA Interim Status 1999 Groundwater Monitoring Assessment," February.

Attachment 1b

FIELD SAMPLING PLAN

Field Sampling Plan for RCRA Groundwater Monitoring of the Slag Pit Sump (WMU # 5)

1. INTRODUCTION

1.1 BACKGROUND

This Field Sampling Plan (FSP) provides sampling and analysis procedures for groundwater samples taken for the Slag Pit Sump located at the FMC Idaho, LLC (FMC) Elemental Phosphorus Plant in Pocatello, Idaho, including the RCRA post-closure care period.

The FSP contains procedures for sample collection, labeling, storage, shipment, chain-of-custody protocols, and quality assurance/quality control (QA/QC). The plan also specifies the analytical parameters, test methods, and threshold concentrations. Implementation of these procedures will ensure that equipment and piping that has come into contact with hazardous waste has been properly decontaminated.

1.2 PREVIOUS RESULTS

In accordance with the interim status requirements of RCRA pursuant to 40 C.F.R. Part 265 Subpart F, the monitoring wells associated with the Slag Pit Sump have been sampled and the samples analyzed, as part of a compliance monitoring program. The results of this program for 1999 are presented in RCRA Interim Status 1999 Groundwater Monitoring Assessment (FMC, February 2000). Table 1 presents the results from analysis of samples collected in the fourth quarter of 1999.

These results, and similar results from previous quarters of sampling and analysis, were subjected to several statistical tests to determine if the Slag Pit Sump is leaking. One test compared the concentrations in downgradient wells with the concentrations in upgradient wells. A second test compared the mean concentrations in 1999 with mean concentrations in previous years, and a third test compared 1999 concentrations in downgradient wells with downgradient well concentrations from previous years. Based on these tests, it was concluded that the Slag Pit Sump is not currently leaking, but has previously leaked.

TABLE 1

ANALYTICAL RESULTS FROM FOURTH QUARTER 1999 FOR SLAG PIT SUMP

Constituent	108	121	122	123
Total Ammonia (NH_3 + NH_4 as N) (mg/L)	0.2 **U**J	0.02 **U**J	0.3 J	4.5 J
Arsenic, total (mg/L)	0.0258	0.0206	0.0399	0.366
Cadmium, total (mg/L)	0.0005 **U**	0.0005 **U**	0.0005 **U**	0.0005 **U**
Chloride (mg/L)	218 U	264 U	338 U	501 U
Fluoride (mg/L)	2.2 U	5.8 U	0.5 **U**J	0.69 U
Nephelometric turbidity (NTU)	0.4	0.4	1	0.3
Nitrate (NO_3^- as N) (mg/L)	13.8 J	16.4 J	30.3 J	22 J
Orthophosphate (PO_4^{3-} as P) (mg/L)	0.77	1.2	4.9	3.4
pH	6.91	6.9	6.99	6.45
Potassium (mg/L)	258	224	173	32.8
Selenium, total (mg/L)	0.0086	0.0104	0.0061	0.209
Specific conductance, at 25°C (µmho/cm)	2130	2320	2090	3780
Sulfate (mg/L)	327 J	254 J	150 J	689 J
Temperature (^oC)	31	19.3	20	17.1

Qualifiers: **U** - Measured Not Detected J - Estimated
U - Qualified Not Detected R - Rejected

2. SAMPLING OBJECTIVES

The objectives of sampling the monitoring wells associated with the Slag Pit Sump are to:

- Collect samples representative of groundwater flowing beneath the unit.
- Collect data that meets data quality objectives.
- Evaluate the potential impact to groundwater.
- Verify that the concentrations in the groundwater are not increasing.

To meet these objectives, data will be obtained to support several statistical tests designed to indicate whether or not concentrations are increasing.

3. MONITORING LOCATIONS AND FREQUENCY

Well 121 is the upgradient monitoring well for the Slag Pit Sump and Wells 122, 108, and 123 are the downgradient wells. Table 2 presents a summary of well construction details. The well construction logs appear in Appendix A of this FSP.

TABLE 2
WELL CONSTRUCTION SUMMARY

Well ID	Northing	Easting	Top of Casing Elevation (FTMSL^)	Depth to Screen (ft#)	Depth to Filter Pack (ft#)	Total Depth of Well (ft#)	Total Depth Explored (ft#)	Depth to Ground-water (ft#)*	Well Diameter (inches)
121	451,767	556,106	4,485.6	106.0	96.0	118.5	120.0	89.1	4
108	452,317	556,574	4,482.4	97.6	91.0	110.1	150.0	87.3	4
122	452,470	556,282	4,475.9	101.5	90.0	113.0	121.5	80.6	4
123	452,221	557,000	4,484.1	106.5	99.0	118.5	121.2	88.8	4

* Determined in October 1997 and reported in RCRA Interim Status 1997 Groundwater Monitoring Assessment, February 1998.

^ Feet Above Mean Sea Level

Feet Below Ground Surface

3.1 GROUNDWATER MONITORING WELL SAMPLES

One groundwater monitoring well sample will be collected quarterly from each of the wells associated with the Slag Pit Sump in accordance with the procedures specified in Section 5. Each sample will then be submitted to the laboratory in accordance with the procedures specified in Section 6.

3.2 DUPLICATE GROUNDWATER MONITORING WELL SAMPLES

At a minimum, duplicate groundwater samples will be collected at a frequency of one per sample delivery group or one per twenty samples collected. Field blank samples will also be collected. Rinsate blanks will be collected at a minimum frequency of one per sampling apparatus. Since the monitoring well network will be sampled during facility-wide sampling events, a duplicate sample may not be collected from one of the Slag Pit Sump wells. However, if a duplicate is to be collected from one of the Slag Pit Sump wells, it should normally be collected from Well 123.

In the fourth quarter of 1997, samples from Well 123 contained detectable concentrations of arsenic, fluoride, and selenium.

3.3 LABORATORY QUALITY CONTROL SAMPLES

At a minimum, laboratory quality control samples will also be collected at a frequency of one per sample delivery group or one per twenty samples collected. A control well(s) is specified for each sampling event and it is the source of the QC sample(s) for the delivery group, at a minimum of one per delivery group or one per every 20 samples. However, if a quality control sample is to be collected from the Slag Pit wells, it should be collected from Well 122. In the fourth quarter of 1999, samples from Well 122 contained detectable concentrations of arsenic and selenium.

4. SAMPLE DESIGNATION

All samples collected will be labeled in a clear and precise way for proper identification in the field and for tracking in the laboratory. The samples will have preassigned, identifiable, and unique numbers. At a minimum, the sample labels will contain the following information:

- Facility name.
- Sample number.
- Date of collection.
- Time of collection.
- Analytical parameter.
- Method of preservation.

Every sample, including samples collected from a single location but going to separate laboratories, will be assigned a unique sample number.

5. SAMPLING EQUIPMENT AND PROCEDURES

This section describes the procedures to be used to collect groundwater samples. All samples will be collected in accordance with the procedures presented in this section and handled in accordance with the procedures presented in Section 6.

5.1 FIELD LOGBOOKS

Field logbooks will document where, when, how, and from whom any vital project information was obtained. Logbook entries will be complete and accurate enough to permit reconstruction of field activities. At a minimum, the following sampling information will be recorded:

- Sample location, station location, and description.

- Sample number.
- Sampler's name(s).
- Date and time of sample collection.
- Type of sample (i.e., regular, QA sample designation).
- Type of sampling equipment used.
- Onsite measurement data (e.g., temperature, pH, conductivity).
- Field observations and details important to analysis or integrity of samples (e.g., heavy rains, odors, colors).
- Type of preservation used.

In addition, the following will be recorded in a separate field book:

- Chain-of-custody form numbers and chain-of-custody seal numbers.
- Shipping arrangements (i.e., Federal Express air bill number).
- Recipient laboratory(ies).

5.1.1 Sample Coding in Field Logbooks

The station location will be described in the logbook as follows, in a manner consistent with the conventions used during the Remedial Investigation:

A two-digit number will be used to indicate the year in which the sample was collected, for example “97” indicates a sample was collected in 1997. This number will be followed by two others indicating the month in which the sample was collected, for example “11” indicates a sample was collected in November. Finally, three digits will identify the well from which the sample was collected. The location description, 9711165, indicates a sample collected from Well 165 in November 1997.

A two-letter code will be used to identify the sample matrix. These are matrix codes such as GW for groundwater.

A three-digit or descriptive letter combination will be used to identify the boring or well location from which a sample is collected. Samples collected for field QC will be identified by a three-digit or descriptive letter combination. Numbers for well locations and field QC will be grouped as follows:

- FMC Facility: 100 series numbers.

- Field Duplicate: 600 series starting with 600 for each sampling event and continuing consecutively during the event for duplicates collected.
- Rinsate: 700 series numbers
- Distilled/deionized water blank: FDI
- Pour Blank: PBI

Samples collected for laboratory QC will be identified on bottles and field paperwork using an MS or MSD designation as a suffix to the location; and an A, B, or C designation as a suffix to the sample identifier code. These QC codes will be designated as follows:

- A - Original unspiked sample
- B - Matrix spike
- C - Matrix spike duplicate
- MS - Matrix spike
- MSD - Matrix spike duplicate

The date of collection will be indicated in mm/dd/yy format, and the time will be indicated in accordance with the military convention. The analytical parameter and method of preservation will be indicated in an unambiguous shorthand, such as F^- for fluoride.

Logbooks will be bound with consecutively numbered pages. Each page will be dated and the time of entry noted in military time. All entries will be legible, written in black ink, and signed by the individual making the entries. Language will be factual, objective, and free of personal opinions or inappropriate terminology. In addition to the sampling information, the following specifics will also be recorded in the field logbook:

- Team members.
- Time of site arrival/entry on site and time of site departure.
- Other personnel on site.
- Any deviations from sampling plans, site safety plans, and QAPP procedures.
- Any changes in personnel and responsibilities as well as reasons for the changes.
- Equipment calibration and equipment model and serial number.

5.1.2 Sample Coding on Sample Containers

One objective of the field sampling program is to deliver "blind" sample containers to the laboratory for analysis. That is, the laboratory should not be knowledgeable of the station from which the groundwater sample was collected. Nor should the laboratory be able to recognize whether a container holds a regular groundwater sample or a field QC sample on the basis of the coding system used to label the sample container.

The sample team leader will, therefore, create a unique number for each sample container. The field logbook will contain a matrix that cross-references this container number to the sample code described in Section 5.1.1.

Upon receipt of analytical results from the laboratory, the groundwater sampling contractor will re-associate these analytical data with the true sample code in the groundwater monitoring database using the cross-references recorded in the field log book. These re-associations will be fully verified.

5.2 GROUNDWATER MONITORING WELL SAMPLE COLLECTION

5.2.1 Water Level Measurements

Water levels in each well will be established in one 4- to 6-hour period before purging and sampling. If well heads are accessible, wells will be sounded for depth to water from the top of the casing and total well depth prior to purging. An electronic sounder, accurate to the nearest (+/–) 0.01 feet, will be used to measure depth to water in each well. When using an electronic sounder, the probe is lowered down the casing to the top of the water column. The graduated markings on the probe wire are used to measure the depth to water from the surveyed point on the rim of the well casing. Typically, the measuring device emits a constant tone when the probe is submerged in standing water, and most electronic water level sounders have a visual indicator consisting of a small light bulb or diode that turns on when the probe encounters water. Water level sounding equipment will be decontaminated before and after use in each well. Water levels will be first measured in wells that have the least amount of known contamination first.

5.2.2 Well Purging

All wells will be purged prior to sampling. Three to five casing volumes of water will be purged using an electric submersible pump or hand pump depending on the diameter and capacity of the well. When pumps are used for purging, clean flexible plastic or Teflon tubes will be used for

groundwater extraction. All tubes will be decontaminated before and after use in each well. Pumps will be placed approximately 10 feet below the water level in the well to permit reasonable drawdown but to prevent cascading conditions. If necessary, purge water will be collected into a measured container to record the purge volume.

Casing volumes will be calculated based on total well depth and standing water level; casing diameter will be based on the results of previous measurements. Monitoring well construction details are summarized in Table 2 along with water elevations determined in the fourth quarter of 1997.

One casing volume will be calculated as:

$$V = \pi R^2 h / 19.25$$

where:

V is the volume of one well casing of water (in gallons, 1 gallon = 7.48 ft^3);

R is one-half the inner diameter of the well casing (in inches); and

h is the total depth of water in the well (in feet).

Prior to the start of sampling and after each well casing volume is purged, water temperature, pH, specific conductance, and turbidity will be measured using field test meters. The measurements will be recorded. Samples will be collected after these parameters have stabilized, indicating representative formation water is entering the well. Three consecutive measurements which display consistent values of all parameters will be taken prior to sampling. Samples will be collected after three well casing volumes if parameters have stabilized. Typically, the temperature should not vary by more than (+/–)1°C, pH by more than 0.2 pH units, and specific conductance by more than 10 percent from reading to reading. No water that has been tested with a field meter probe will be collected for chemical analysis. If these parameters have not stabilized after five casing volumes have been purged, purging will cease, a notation will be recorded in the field logbook, and samples will be collected. In accordance with Section 5.1, depth-to-water measurements, field measurements of parameters, and purge volumes will be recorded in the field logbook.

If a monitoring well dewaters during purging and three casing volumes are not purged, that well will be allowed to recharge up to 80 percent of static water column, and dewatered once more.

After water levels have recharged to 80 percent of the static water column, groundwater samples will be collected.

All field meters will be calibrated according to manufacturers' guidelines and specifications prior to beginning field work every day. Field meter probes will be decontaminated before and after use at each well.

5.2.3 Well Sampling

Groundwater samples will be collected from the monitoring wells specified in Table 1. Prior to sampling, the water level in the well will be measured as described in Section 5.2.1 and wells will be purged as described in Section 5.2.2. All wells will be sampled within 24 hours after purging. Clean nitrile gloves will be worn while collecting samples. Groundwater samples will be collected directly from pump tubing into the appropriate sample container, preserved as described in Section 6, and chilled and processed for shipment to the laboratory. When transferring samples, care will be taken not to touch the discharge tubing to the sample container.

Groundwater samples for P_4 should be poured gently into the sample container to minimize agitation which might drive off the volatile P_4. If bubbling does occur while transferring the sample to the container, the sample should be discarded and another sample collected. Each container should be filled with sample until it overflows. Each container should be tightly sealed with a PTFE-lined cap. The container should then be inverted to check for air bubbles. If any air bubbles are present, a new sample will be collected.

Samples for dissolved metals analyses will be filtered in the field using a Geotech Masterflex peristaltic pump or equivalent. Normally, groundwater samples with turbidity levels >10 NTU (after stabilization of field parameters pH, specific conductance, and temperature) will be analyzed for both total and dissolved metals. Groundwater samples for dissolved metal analyses will be field-filtered using the following procedures:

1. Samples will be collected directly into or transferred from the bailer or pump to a pre-cleaned unpreserved glass or polyethylene sample container.
2. The sample will then be filtered using tygon, viton, or other compatible tubing connected to a 0.45 micron disposable filter. The sample will be filtered directly into a sample container containing preservatives.
3. The type of container, volume of water to be collected, and preservation method will be the same for filtered and unfiltered samples which will be analyzed for metals.

4. Filters will be discarded and replaced after each use. Tubing used for filtration will be discarded after each use.

Section 6 gives detailed procedures for sample packaging, labeling, and shipping. All groundwater sampling equipment will be decontaminated before and after each sample is collected using procedures outlined in Section 5.6.

5.3 DUPLICATE GROUNDWATER MONITORING WELL SAMPLE COLLECTION

When collecting duplicate groundwater samples, bottles with two different sample designations will be alternated in the filling sequence.

5.4 LABORATORY QA/QC SAMPLE COLLECTION

When collecting laboratory QA/QC samples, a single sample designation will be assigned to a double-volume sample.

5.5 CONDUCTIVITY, TEMPERATURE, TURBIDITY, AND pH MEASUREMENTS

Electrical conductivity, water temperature, turbidity, and pH measurements will be made in the field during purging, when a water sample is collected. The water sample will be placed in a bottle or jar used solely for field testing. A field pH meter with a combination electrode or equivalent will be used for pH measurement. A field conductivity meter will be used for specific conductance measurements. A nephelometer-type turbidimeter will be used for turbidity measurements. Temperature measurements will be performed using standard thermometers or equivalent temperature meters. Combination instruments capable of measuring two or more parameters may also be used.

All instruments will be calibrated in accordance with manufacturers' recommendations. If conductivity standards or pH buffers are used in the calibration, their values will be recorded in the field notebook. The sample testing jar and all probes will be thoroughly cleaned and rinsed with distilled water prior to any measurements.

5.6 EQUIPMENT DECONTAMINATION PROCEDURE

Decontamination of sampling equipment will be consistently conducted in a manner to ensure the quality of samples collected. The resulting decontamination fluids and residual material will be handled in the manner described in Section 7 to avoid recontamination.

All equipment that comes into contact with potentially contaminated water will be decontaminated. Decontamination will consist of steam-cleaning equipment prior to and after each use. Sampling equipment will be steam-cleaned or washed with a non-phosphate detergent scrub, followed by fresh water and de-ionized water rinses. Equipment will be decontaminated on pallets or plastic sheeting, and clean equipment will be used immediately or stored on plastic sheeting in uncontaminated areas. Materials to be stored more than a few hours will also be covered.

Sampling equipment will either be cleaned at the sampling location using non-phosphate detergent followed by fresh water and deionized water rinse, or will be steam-cleaned along with other equipment at a decontamination station.

Sampling equipment will be decontaminated as follows:

1. The exterior surfaces and accessible interior portions of submersible and hand pumps will be steam-cleaned or cleaned with a non-phosphate detergent and water prior to each use. Inaccessible interior portions of the pumps will be cleaned prior to each use by purging water through the pump and discharge lines. Hoist rods and cables used in connection with submersible pumps shall be cleaned using the procedures described above. An effort will be made to sample the wells in the order of least to most contaminated to further minimize the risk of sample cross-contamination.
2. Bailers and tubing used for collection of the groundwater samples will be cleaned at the start of the job and between wells by steam cleaning or with a non-phosphate detergent wash followed by a tap water, and finally, a de-ionized water rinse.
3. Steel tapes, water probes, water level indicators, transducers, thermometers, and water quality meters will be rinsed in de-ionized water or cleaned in a detergent solution and rinsed once in fresh water after each use.
4. Filters used in field-filtration of groundwater samples will be discarded. Rinsate blanks will be collected periodically from the field filtration and submersible pump setups. Tubing used in filtration will be new.

6. SAMPLING HANDLING AND ANALYSIS

This section describes sample handling procedures including sample containers, sample preservation, shipping requirements and holding times, and sample analysis. These procedures are designed to ensure that samples are preserved and transported to the laboratory in a manner that is consistent and maintains sample integrity. Table 3 summarizes sample containers, preservatives, volume, and holding times.

6.1 SAMPLE HANDLING

Sample containers will be pre-cleaned and will be rinsed prior to sample collection. Preservatives, if required, will be added to the containers prior to shipment of the sample containers to the laboratory.

TABLE 3
SAMPLE HANDLING AND PRESERVATION PROCEDURES

Parameter	Recommended Container	Preservative	Maximum Holding Time
Ammonia	1-liter polyethylene bottle	H_2SO_4 to pH<2; Cool to 4°C	28 days
Water Quality (Cl^-, F^-, SO_4^{3-})	1-liter polyethylene bottle	Cool to 4°C	6 months
As, Cd, Se, K	2 1-liter polyethylene bottles	HNO_3 to pH<2, Cool to 4°C	6 months
Total Phosphorus	1-liter polyethylene bottle	Cool to 4°C	30 days
Nitrate	1-liter polyethylene bottle	2 ml conc. H_2SO_4; cool to 4°C	5 days
Elemental Phosphorus	½-liter amber glass bottle; zero head space	Cool to 4°C	5 days for extraction

6.2 SAMPLE SHIPMENT

All sample containers will be placed in a strong, outside shipping container. The following outlines the packaging procedures that will be followed.

1. When ice is used, secure the drain plug of the cooler with fiberglass tape to prevent melting ice from leaking out of the cooler.
2. Line the cooler with bubble wrap, as needed, to prevent breakage during shipment.
3. Check screw caps for tightness and, if not full, mark the sample volume level of liquid samples on the outside of their sample bottles with indelible ink.
4. Custody-seal all container tops.
5. Affix sample labels onto the containers and write sample number on container with indelible ink.
6. Wrap all glass sample containers in bubble wrap to prevent breakage.

All samples will be placed in coolers with the appropriate chain-of-custody form. All forms will be enclosed in a large plastic bag and affixed to the underside of the cooler lid. Empty space in the cooler will be filled with bubble wrap or Styrofoam peanuts to prevent movement and breakage during shipment. Ice used to cool samples will be placed on top and around the samples to chill them to the correct temperature. Each ice chest will be securely taped shut with nylon strapping tape; and custody seals will be affixed to the front and back of each cooler.

6.3 SAMPLE ANALYSIS

Required sample analyses and methods are summarized in Table 4.

TABLE 4
SUMMARY OF REQUIRED ANALYSES
DETECTION MONITORING PROGRAM

Parameter	Method Number	Method Type	Method Detection Limit (ppm)
Ammonia	350.3[1] (a)	Potentiometric, Ion Selective Electrode	0.2
Potassium	6010B (b)	Inductively Coupled Plasma Atomic Emission Spectrometry	5
Chloride	325.3[1] (a)	Titrimetric (mercuric nitrate)	all ranges
Fluoride	340.2[1] (a)	Potentiometric, Ion Selective Electrode	0.1
Nitrate	353.2[1] (a)	Colorimetric (brucine sulfate)	0.1
Phosphorus (P_4)	7580 (b)	Gas Chromatography/Nitrogen Phosphorus Detector	0.00002
Orthophosphate	365.2[1] (a)	Colorimetric (ascorbic acid)	0.1
Total Phosphorus	365.4[1] (a)	Colorimetric	0.01
Sulfate	375.4[1] (a)	Gravimetric	5
Arsenic	6010B (b)	Inductively Coupled Plasma Atomic Emission Spectrometry	0.05
Cadmium	6010B (b)	Inductively Coupled Plasma Atomic Emission Spectrometry	0.001
Selenium	6010B (b)	Inductively Coupled Plasma Atomic Emission Spectrometry	0.08

(a) Methods for Chemical Analysis of Water and Wastes, EPA –600/4–82–D55, Method 300.0A or SW–846 Method 9056 may be used as an alternate method, if appropriate.

(b) Test Method for Evaluating Solid Waste, EPA SW–846, Third Edition, Update III, as revised through 1997.

[1] No equivalent SW–846 method

7. DISPOSAL OF WASTE

In the process of collecting groundwater samples, different types of potentially contaminated wastes will be generated. The expected wastes are:

- Used personal protective equipment (PPE)
- Disposable sampling equipment
- Decontamination fluids
- Purged groundwater

This section describes the procedures that will be followed to handle these wastes. The procedures have enough flexibility to allow the sampling team to use its professional judgment on the proper method for the disposal of each type of waste generated at each sampling location.

7.1 USED PPE AND DISPOSABLE SAMPLING EQUIPMENT

Used PPE and disposable equipment will be bagged and accumulated in dumpsters on site for disposal in an offsite landfill. Any PPE and disposable equipment that could be considered reusable will be rendered inoperable before disposal.

7.2 DISPOSAL OF DECONTAMINATION FLUIDS AND PURGED GROUNDWATER

Decontamination fluids and purged groundwater will be containerized, if necessary, and transferred to FMC's ponds. These waters will be containerized initially, if the decontamination set up or the well being purged are located such that decontamination fluid or purge water cannot be conveniently pumped directly to FMC's ponds. Due to the low levels of contaminants in groundwater (i.e., analytical results of previous groundwater samples have not exceeded the Toxicity Criteria presented in 40 C.F.R. Part 261 Subpart C), the decontamination fluids and groundwater will be managed as non-hazardous waste water.

APPENDIX A

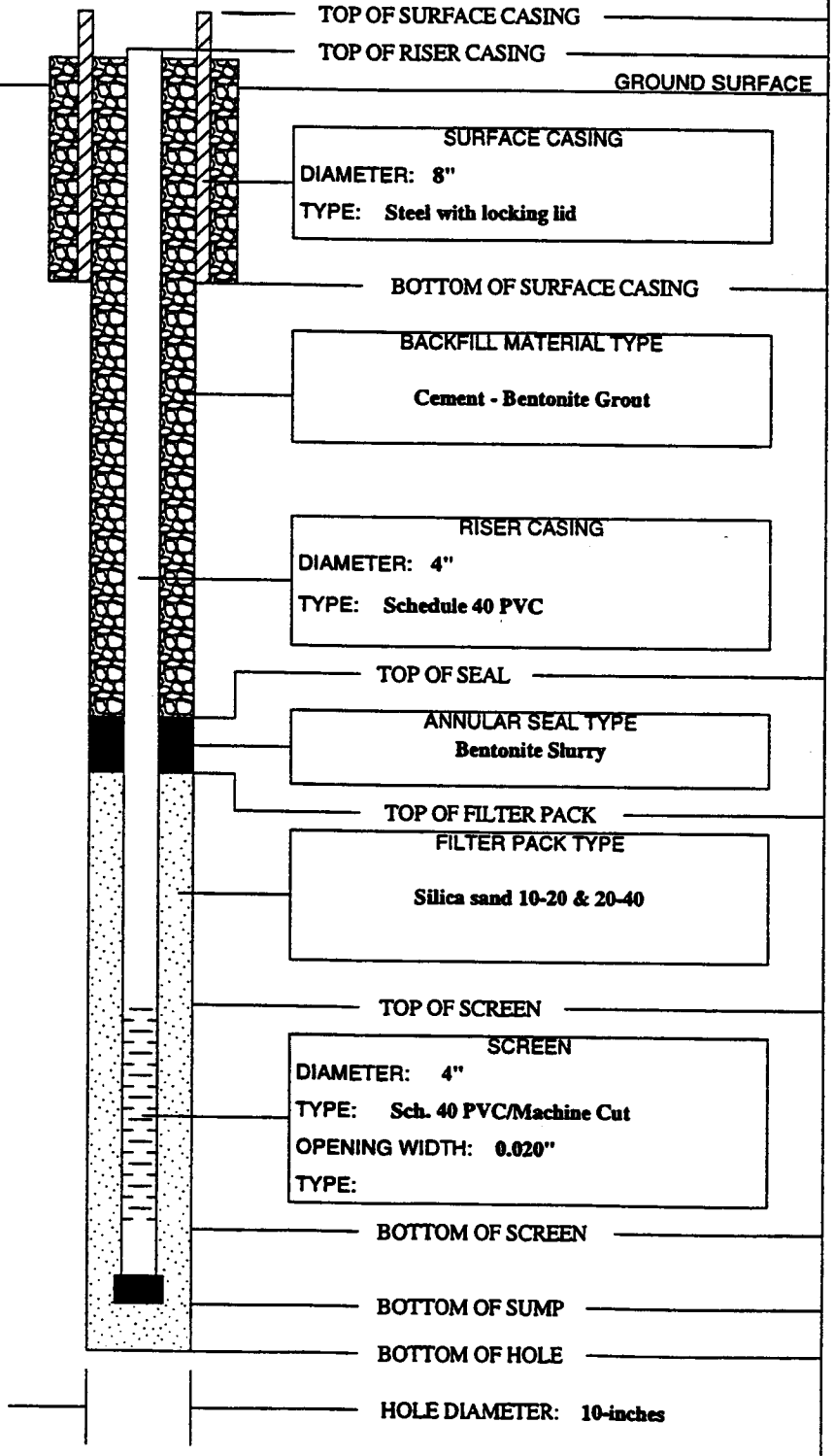
WELL CONSTRUCTION LOGS

MONITORING WELL

PROJECT	WELL NO.
EMF POCATELLO, ID	108

JOB NO.	SITE	COORDINATES and / or STATIONING
20906	Northeast of Slag Pit Sump	N 452,316.5 : E 556,573.7

BEGUN	COMPLETED	PREPARED BY	REFERENCE POINT FOR MEASUREMENTS
10-12-90	10-12-90	Curtis Obi	Top of PVC casing (water level)



	DEPTH (FT)	ELEV. (FTMSL)
TOP OF SURFACE CASING	-2.3	4482.55
TOP OF RISER CASING	-2.1	4482.4
GROUND SURFACE	0.0	4480.3
BOTTOM OF SURFACE CASING	2.7	4477.6
TOP OF SEAL	87.0	4393.3
TOP OF FILTER PACK	91.0	4389.3
TOP OF SCREEN	97.6	4382.7
BOTTOM OF SCREEN	107.6	4372.7
BOTTOM OF SUMP	110.1	4370.2
BOTTOM OF HOLE	150.0	4330.3

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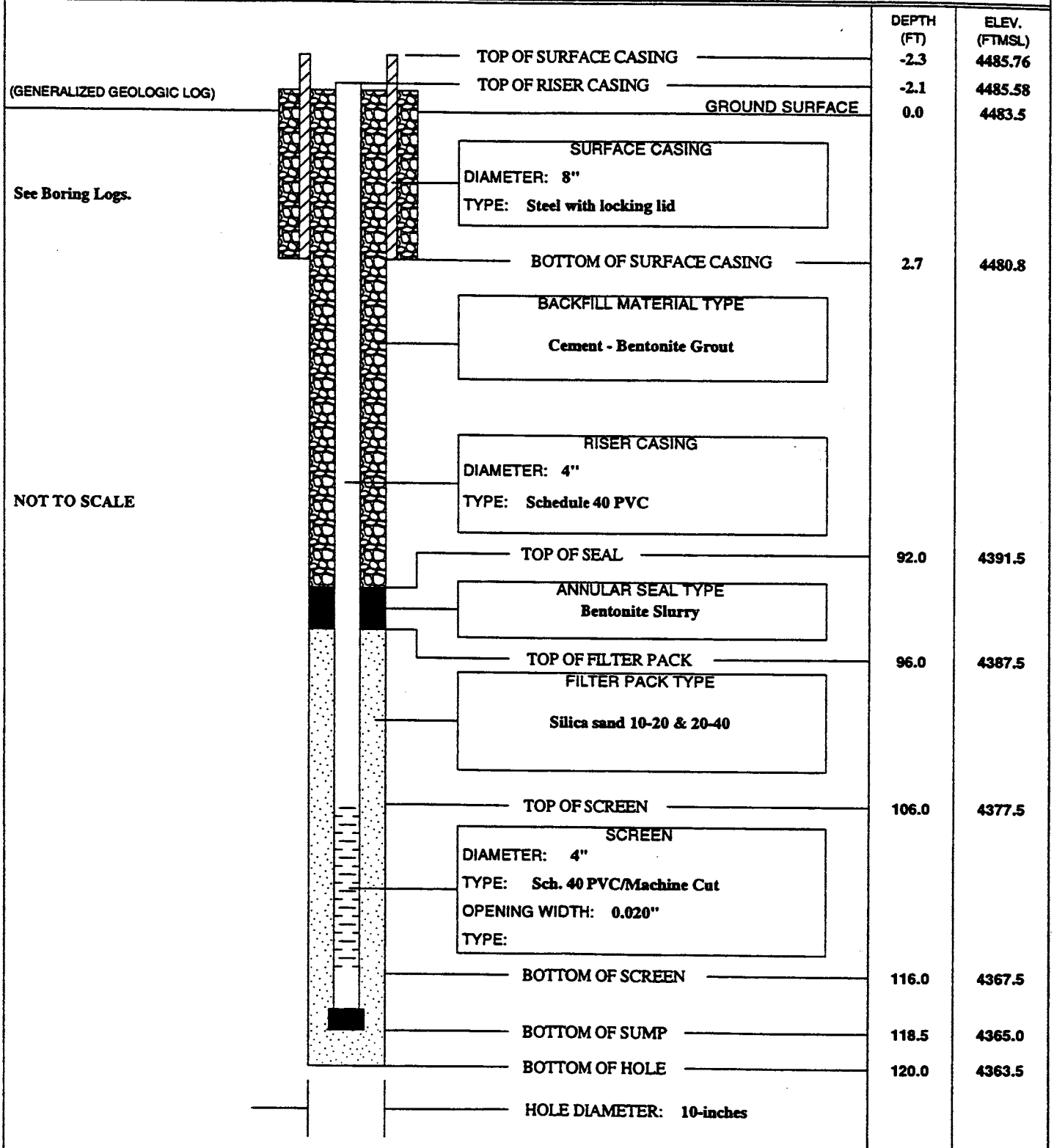
NOT TO SCALE

MONITORING WELL

PROJECT	WELL NO.
EMF POCATELLO, ID	121

JOB NO.	SITE	COORDINATES and / or STATIONING
20906	Southwest of Slag Pit Sump	N 451,766.8 : E 556,105.7

BEGUN	COMPLETED	PREPARED BY	REFERENCE POINT FOR MEASUREMENTS
10-10-90	10-10-90	Curtis Obi	Top of PVC casing (water level)



	DEPTH (FT)	ELEV. (FTMSL)
TOP OF SURFACE CASING	-2.3	4485.76
TOP OF RISER CASING	-2.1	4485.58
GROUND SURFACE	0.0	4483.5
BOTTOM OF SURFACE CASING	2.7	4480.8
TOP OF SEAL	92.0	4391.5
TOP OF FILTER PACK	96.0	4387.5
TOP OF SCREEN	106.0	4377.5
BOTTOM OF SCREEN	116.0	4367.5
BOTTOM OF SUMP	118.5	4365.0
BOTTOM OF HOLE	120.0	4363.5

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Report Form: EMF-WELLOG2

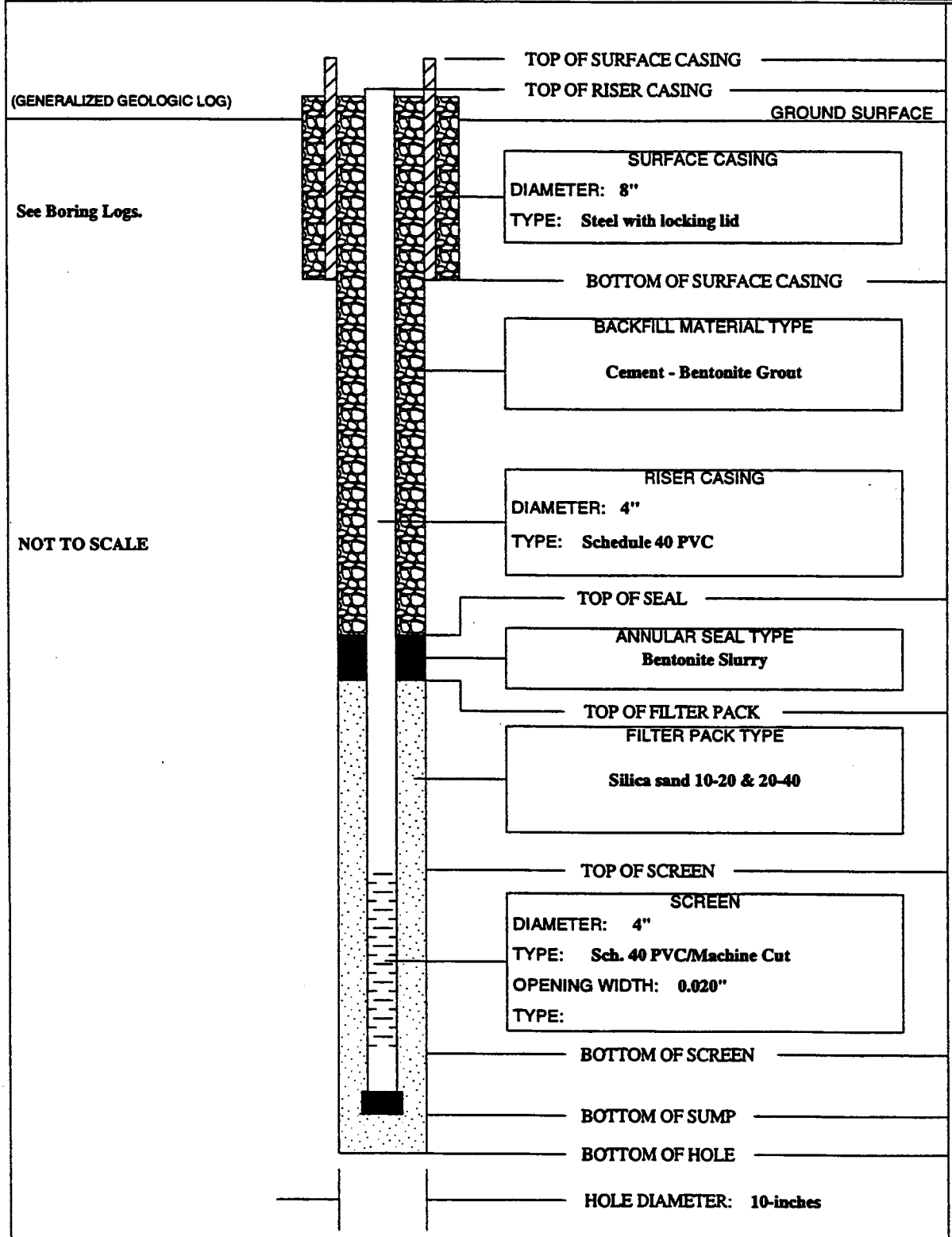
NOT TO SCALE

MONITORING WELL

PROJECT	WELL NO.
EMF POCATELLO, ID	122

JOB NO.	SITE	COORDINATES and / or STATIONING
20906	North of Slag Pit Sump	N 452,470.2 : E 556,282.4

BEGUN	COMPLETED	PREPARED BY	REFERENCE POINT FOR MEASUREMENTS
10-11-90	10-11-90	Curtis Obi	Top of PVC casing (water level)



	DEPTH (FT)	ELEV. (FTMSL)
TOP OF SURFACE CASING	-2.2	4476.1
TOP OF RISER CASING	-2.0	4475.92
GROUND SURFACE	0.0	4473.9
BOTTOM OF SURFACE CASING	2.8	4471.1
TOP OF SEAL	86.0	4387.9
TOP OF FILTER PACK	90.0	4383.9
TOP OF SCREEN	101.5	4372.4
BOTTOM OF SCREEN	111.5	4362.4
BOTTOM OF SUMP	113.0	4360.9
BOTTOM OF HOLE	121.5	4352.4

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Report Form: EMF-WELLOG2

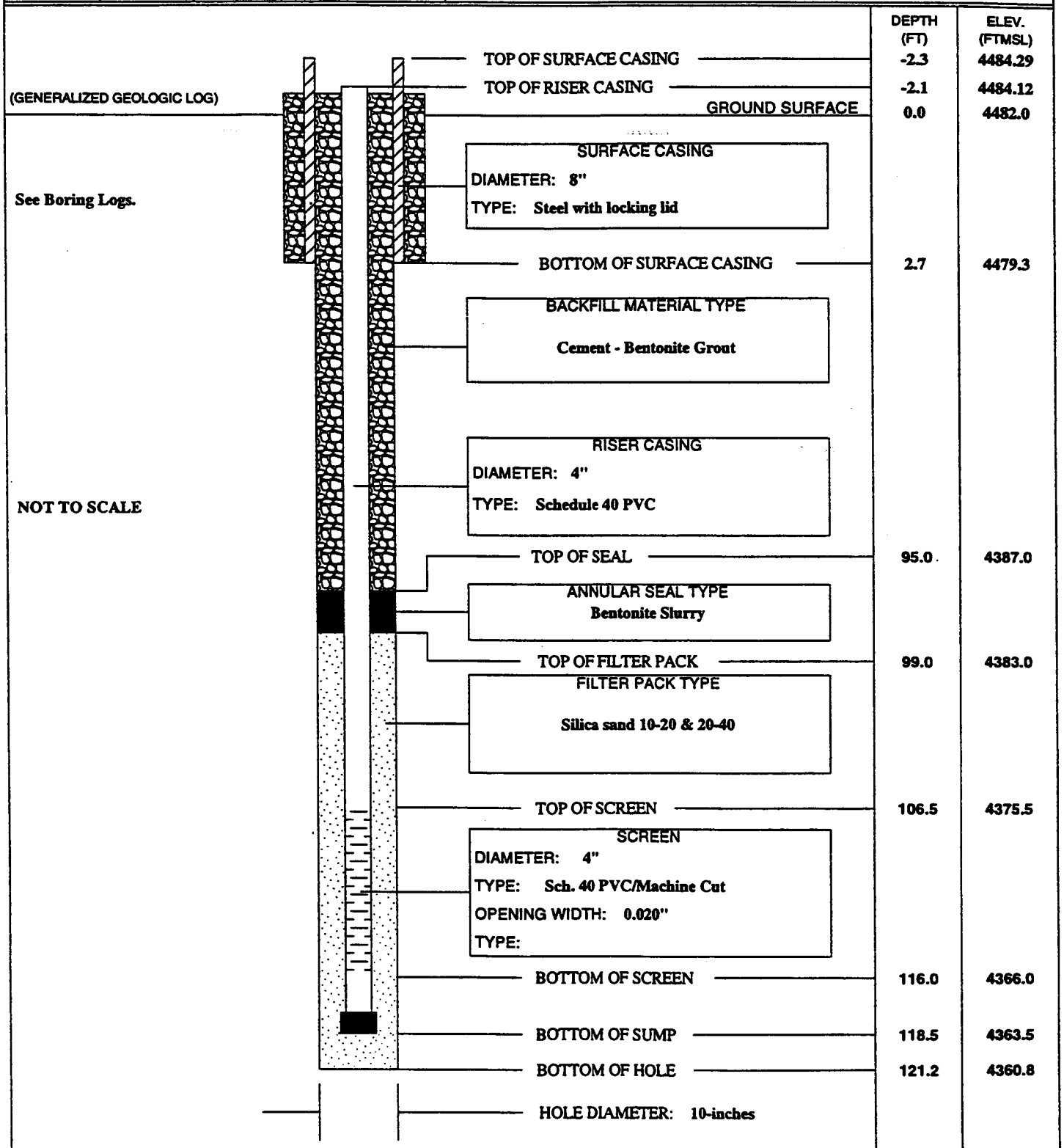
NOT TO SCALE

MONITORING WELL

PROJECT	WELL NO.
EMF POCATELLO, ID	123

JOB NO.	SITE	COORDINATES and / or STATIONING
20906	Northeast of Slag Pit Sump	N 452,221.3 : E 557,000.1

BEGUN	COMPLETED	PREPARED BY	REFERENCE POINT FOR MEASUREMENTS
10-13-90	10-13-90	Curtis Obi	Top of PVC casing (water level)



	DEPTH (FT)	ELEV. (FTMSL)
TOP OF SURFACE CASING	-2.3	4484.29
TOP OF RISER CASING	-2.1	4484.12
GROUND SURFACE	0.0	4482.0
BOTTOM OF SURFACE CASING	2.7	4479.3
TOP OF SEAL	95.0	4387.0
TOP OF FILTER PACK	99.0	4383.0
TOP OF SCREEN	106.5	4375.5
BOTTOM OF SCREEN	116.0	4366.0
BOTTOM OF SUMP	118.5	4363.5
BOTTOM OF HOLE	121.2	4360.8

Update: Apr 22, 1998
Report Form: EMF-WELLOG2

NOT TO SCALE